NAVY
STTR FY09.B PROPOSAL SUBMISSION INSTRUCTIONS

INTRODUCTION:

The responsibility for the implementation, administration and management of the Navy STTR Program for this solicitation is with the Naval Air Systems Command (NAVAIR). The NAVAIR STTR Program Manager is Mrs. June Chan. If you have questions of a general nature regarding the Navy's STTR Program, contact Mrs. Chan (june.chan@navy.mil). For inquiries or problems with electronic submission, contact the DoD Help Desk at 1-866-724-7457 (8:00 am to 5:00 pm ET). For technical questions about a topic, contact the Topic Authors listed under each topic before **24 August 2009**. Beginning **24 August**, for technical questions you must use the SITIS system **www.dodsbir.net/sitis** or go to the DoD Web site at **http://www.acq.osd.mil/sadbu/sbir** for more information.

The Navy's STTR Program is a mission-oriented program that integrates the needs and requirements of the Navy's Fleet through R&D topics that have dual-use potential, but primarily address the needs of the Navy. Companies are encouraged to address the manufacturing needs of the Defense Sector in their proposals. Information on the Navy STTR Program can be found on the Navy STTR Web site at **http://www.onr.navy.mil/sbir.** Additional information pertaining to the Department of the Navy's mission can be obtained by viewing the Web site at **http://www.navy.mil.**

PHASE I PROPOSAL SUBMISSION:

Read the DoD front section of this solicitation for detailed instructions on proposal format, submission instructions and program requirements. When you prepare your proposal, keep in mind that Phase I should address the feasibility of a solution to the topic. The Navy only accepts Phase I proposals with a base effort not exceeding $70,000 and with the option not exceeding $30,000. The technical period of performance for the Phase I base should be 7 months and will commence on or about 01 July 2010. The Phase I option should be 3 months and address the transition into the Phase II effort. Phase I options are typically only funded after the decision to fund the Phase II has been made. Phase I technical proposals, including the option, have a 25-page limit (see section 3.4). The Navy will evaluate and select Phase I proposals using scientific review criteria based upon technical merit and other criteria as discussed in this solicitation document. Due to limited funding, the Navy reserves the right to limit awards under any topic and only proposals considered to be of superior quality will be funded. The Navy typically provides a firm fixed price contract or awards a small purchase agreement as a Phase I award.

All proposal submissions to the Navy STTR Program must be submitted electronically. It is mandatory that the **entire** technical proposal, DoD Proposal Cover Sheet, Cost Proposal, and the Company Commercialization Report are submitted electronically through the DoD SBIR/STTR Submission Web site at **http://www.dodsbir.net/submission**. This site will lead you through the process for submitting your technical proposal and all of the sections electronically. Each of these documents is submitted separately through the Web site. To verify that your technical proposal has been received, click on the "Check Upload" icon to view your uploaded technical proposal. If you have any questions or problems with the electronic submission contact the DoD SBIR Helpdesk at 1-866-724-7457 (8:00 am to 5:00 pm ET). Your proposal **must** be submitted via the submission site before **6:00 am ET, Wednesday, 23 September 2009**. An electronic signature is not required when you submit your proposal over the Internet.

Within one week of the Solicitation closing, you will receive notification via e-mail that your proposal has been received and processed for evaluation by the Navy. Please make sure that your e-mail address is entered correctly on your proposal coversheet or you will not receive a notification.

PHASE I ELECTRONIC SUMMARY REPORT:

In addition to the final report required in the funding agreement, all awardees must electronically submit a non-proprietary summary of that report through the Navy SBIR/STTR Web site. It must not exceed 700 words and should include potential applications and benefits. Submit the summary at **http://www.onr.navy.mil/sbir**, click on "Submission", and then click on "Submit a Phase I or II Summary Report". This summary will be publicly accessible via the Navy's Search Database.

PHASE II PROPOSAL SUBMISSION:

Phase II proposal submission is by invitation only. Only those Phase I awardees who achieved success in Phase I, measuring the results achieved against the criteria contained in section 4.3, will be invited to submit a Phase II proposal. If you have been invited to participate, follow the instructions provided in the invitation. The Navy will evaluate and select Phase II proposals using the evaluation criteria in the DoD solicitation. All Phase II proposals must be submitted electronically through the DoD SBIR/STTR Submission Web site.

Under the new OSD (AT&L) directed Commercialization Pilot Program (CPP), the Navy SBIR/STTR Program will be structuring more of our Phase II contracts in a way that allows for increased funding levels based on the projects transition potential. This will be done through either multiple options that may range from $250,000 to $1M each, substantial expansions to the existing contract, or a second Phase II award. For currently existing Phase II contracts, the goals of the CPP will primarily be attained through contract expansions, some of which may significantly exceed the $750,000 recommended limits for Phase II awards not identified as a CPP project. All projects in the CPP will include notice of such status in their Phase II contract modifications.

All awardees, during the second year of the Phase II, must attend a one-day Transition Assistance Program (TAP) meeting. This meeting is typically held during the summer in the Washington, D.C. area. Information can be obtained at **http://www.dawnbreaker.com/navytap**. Awardees will be contacted separately regarding this program. It is recommended that Phase II cost estimates include travel to Washington, D.C. for this event.

As with the Phase I award, Phase II award winners must electronically submit a Phase II summary through the Navy SBIR/STTR Web site at the end of their Phase II.

PHASE II ENHANCEMENT:

The Navy has adopted a New Phase II Enhancement Plan to encourage transition of Navy STTR funded technology to the Fleet. Since the Small Business Technology Transfer Program (STTR) Reauthorization Act of 2001 (Pub. L. 107-50) and the STTR Policy Directive, dated 16 Dec 2005, permit Phase III awards during Phase II work, the Navy may provide a one-to-four match of Phase II to Phase III funds that the company obtains from an acquisition program. Up to

$250,000 in additional STTR funds for $1,000,000 match of acquisition program funding can be provided, as long as the Phase III is awarded and funded during the Phase II.

ADDITIONAL NOTES:

1. The Naval Academy, the Naval Postgraduate School and other military academies are government organizations and therefore do not qualify as partnering research institutions or subcontractors. In the special case of an otherwise qualifying proposal, if there is a compelling need for participation by such an institution, a request for a waiver of this regulation will be sent to the Small Business Administration (SBA); and the contract award will be contingent on the receipt of this waiver.

2. The Navy will allow firms to include with their proposals, success stories that have been submitted through the Navy SBIR Web site at **http://www.onr.navy.mil/sbir**. A Navy success story is any follow-on funding that a firm has received based on technology developed from a Navy SBIR or STTR Phase II award. The success stories should be included as appendices to the proposal. These pages **will not** be counted towards the 25-page limit. The success story information will be used as part of the evaluation of the third criteria, Commercial Potential (listed in Section 4.2 of this solicitation) which includes the Company's Commercialization Report and the strategy described to commercialize the technology discussed in the proposal. The Navy is very interested in companies that transition SBIR/STTR efforts directly into Navy and DoD programs and/or weapon systems. If a firm has never received a Navy SBIR/STTR Phase II it will not count against them.

3. Any contractor proposing research that requires human, animal and recombinant DNA use is advised to view requirements at Web site **http://www.onr.navy.mil/sci_tech/ahd_usage.asp**. This Web site provides guidance and notes approvals that may be required before contract work may begin (reference DoD solicitation preface paragraphs 3.5b(3)(2) and 3.7).

PHASE I PROPOSAL SUBMISSION CHECKLIST:

All of the following criteria must be met or your proposal will be REJECTED.

____1. Make sure you have added a header with company name, proposal number and topic number to each page of your technical proposal.

____2. Your complete STTR Phase I proposal (coversheet, technical proposal, cost proposal, and DoD Company Commercialization Report) has been submitted electronically through the DoD submission site by 6:00 a.m. ET, Wednesday, 23 September 2009.

____3. After uploading your file and it is saved on the DoD submission site as a PDF file, review it to ensure that it appears correctly.

____4. The Phase I proposed cost for the base effort does not exceed $70,000. The Phase I Option proposed cost does not exceed $30,000. The costs for the base and option are clearly separate, and identified on the Proposal Cover Sheet, in the cost proposal, and in the work plan section of the proposal.

NAVY STTR 09B Topic Index

NAVY STTR 09B Topic Descriptions

N09B-T038 TITLE: Innovative Application of Urban ISR (Intelligence, Surveillance, Reconnaissance) Imagery for High Fidelity Training Devices

TECHNOLOGY AREAS: Air Platform, Information Systems, Sensors

OBJECTIVE: Enable real time, geo-specific texture application of intelligence, surveillance and reconnaissance (ISR) data of large urban environments. Achieve a constantly-updated, photo-realistic, varied sensor modeling of large urban areas for training and mission rehearsal.

DESCRIPTION: Current flight simulators use models of buildings in redundant “geo-typical” textures in an effort to represent the large numbers of buildings found in dense urban areas. As a direct result simulations today lack the details specific to actual buildings and changes to those buildings as battles occur. The net result is simulations still lack the realism needed for accurate mission rehearsals and training for specific targets as they appear with varied sensors. As an example, today’s state of the art systems only have the capability to render approximately 500 buildings with geo-specific texturing - while large urban environments like New York City or Baghdad require over 100,000 buildings to yield a realistic simulation.

Photo-realistic terrestrial and oblique aerial cameras can provide high resolution images of every geo-specific building surface under a variety of sensors. This data, coupled with advances in graphics processing units (GPU) resulting in 12 bit texture, cannot be processed by modern day systems. If this imagery could be ported into flight simulators, realism would increase markedly within the targeted areas and could be kept current with the dynamic changes in the real world.

Programs such as Google Earth and Microsoft Virtual Earth "Bird’s Eye" make static satellite and aerial imagery mapping only, those programs do not provide the dynamic, interactive, geo-specific, three dimensional, multi-sensor imagery needed for military simulation. Innovations are needed as increasing volumes of intelligence, surveillance and reconnaissance (ISR) data become available. Previous work related to high dynamic range sensor simulation, addressed physics based modeling but not the generation of source data in a form that adequately drives those models. Efforts that are currently ongoing which are attempting to integrate source data into sensor imagery to support military simulation require inordinate amounts of skilled manual labor.

The developed technology would have application to fixed and rotary wing aircraft, and would be of use in ground vehicle simulators by providing mission rehearsals in photo-realistic urban areas. Only with these innovations will a larger Dynamic Range for higher fidelity sensors be supportable.

PHASE I: Demonstrate feasibility of proposed approaches capable of meeting the characteristics described above. Address the ability to integrate and/or simulate geo-specific ISR urban imagery into existing flight simulators. Proposed approaches should minimize the number of state changes for the GPU in order to optimize performance and maintain equivalency of a real-time (60hz) frame rate.

PHASE II: Develop, integrate, and demonstrate a prototype system that assimilates thousands of urban models with high-resolution building specific texture as they appear with varied sensors. Assess the benefits of the new visual rendering under several sensor conditions. The prototype should be compatible with real-time training simulation.

PHASE III: Commercialize the system and apply to a complex training simulator.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: The developed technology can be applied to commercial flight simulators and entertainment markets. It has application to fixed and rotary wing aircraft, unmanned aircraft, and any simulated entity that has highly dynamic motion on and above a real-world urban area.

REFERENCES:
1. Ephanov A. and Coleman C. "Virtual Texture: A Large Area Raster Resource for the GPU." Interservice/Industry Training, Simulation, and Education Conference (I/ITSEC) 2006.

2. Tsai, F. & Lin, H. -C. (2007). "Polygon-based texture mapping for cyber city 3D building models." International Journal of Geographical Information Science, 21 (9), 965-981

3. Nayak, Shailesh. "ISPRS TC IV: Geo-databases and Digital Mapping - Trends and Challenges." ISPRS VOL 10, 18-20. http://www.isprs.org/publications/highlights/highlights0605/13HL0605Society.pdf

KEYWORDS: Urban Simulation; ISR; Damage Assessment; Texture; Simulation; Sensor; Targeting

N09B-T039 TITLE: Modeling of Small-scale Tilt-rotor Unmanned Air Vehicles

TECHNOLOGY AREAS: Air Platform

OBJECTIVE: Develop and demonstrate modeling techniques tailored towards multi-flight-mode rotors that are suitable for efficient thrust-borne and wing-borne flight of small Unmanned Air Vehicles (UAVs)

DESCRIPTION: Current small Unmanned Air Systems (UASs) have great potential for Department of Defense applications. However, the significant launch and recovery footprint of current systems and the limited range and persistence of today's UASs prevent them from being utilized to their full potential. Technologies are needed that facilitate the development of small Vertical Take-Off and Landing (VTOL) Unmanned Aerial Vehicles (UAVs) that have mission range and endurance far surpassing the current state of the art. For example, the current Scan Eagle UAV, with video payload has a range of approximately 2,500 km and an endurance of approximately 25 hrs. With advanced rotor designs, the objective is to increase these values by at least 50% and gain VTOL capability.

Rotors on aircraft such as the V-22 Osprey must operate over a broad envelope, spanning slow vertical descent to forward flight at high advance ratio. While performance and aero-elastic dynamics of such large-scale rotors have been investigated extensively, the smaller-scale regime (1 - 2 meters rotor diameter) typical of small UAVs has been less well explored. There is currently a significant technology gap in the area of aerodynamic modeling of small-scale air-vehicle rotor systems that are required to operate in-and-between the ranges of helicopter and airplane modes of flight. Additionally, a thorough understanding of static and dynamic loading of the rotor will be required to develop blade construction techniques the result in lightweight, rigid structures.

Innovative approaches to aerodynamic and structural modeling, design optimization, analysis, development of fabrication methods, and testing are required to advance the state of the art for application of multi-flight-mode rotor technology at the small UAV scale (up to ~150 lbs gross weight). An understanding of the aerodynamics of small-scale rotors for thrust-borne to wing-borne flight over the broad range of operating conditions will be required. Performance optimization tools which would allow the designer to tailor the rotor for selected operating modes are required. Structural design tools which would facilitate rotor blade construction should be identified. Model fidelity may be shown through wind tunnel tests and actual flight test in thrust-borne flight, wing-borne flight and selected flight modes in between.

PHASE I: Develop modeling techniques tailored towards multi-flight-mode rotors suitable for efficient thrust-borne and wing-borne flight of small UAVs. Demonstrate proof-of-concept by performing modeling and validation exercises on a representative rotor blade.

PHASE II: Based on Phase I modeling, develop processes and techniques for design optimization and analysis. Design and develop fabrication techniques and construct a demonstration rotor blade for research purposes. Show model fidelity through wing tunnel and flight test.

PHASE III: Develop a fully functional VTOL UAV prototype and demonstrate fixed wing flight performance that exceeds that of currently fielded small UAVs.

PRIVATE SECTOR COMMERCIAL POTENTIAL/DUAL-USE APPLICATIONS: Small multi-flight-mode UAVs would offer the benefits of VTOL and efficient forward flight to emerging civil UAV applications such as forest-fire and disaster monitoring, environmental reconnaissance, border patrol, and search and rescue.

REFERENCES:
1. David Piatak, Mark Nixon, and John Kosmatka. "Stiffness characteristics of composite rotor blades with elastic couplings." NASA Technical Paper 3641, 1997.

2. Phillipe Poisson-Quinton and Woodrow Cook. "A summary of wind tunnel research on tilt-rotors from hover to cruise flight." http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19730010285_1973010285.pdf . NASA-TM-X-68948, 1972.

3. Harsha Prahlad and Inderjit Chopra. "Characterisation of SMA Torsional Actuators for Active Twist of Tilt Rotor Blades." http://www.aiaa.org/content.cfm?pageid=406&gTable=Paper&gID=768. 43rd AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Denver, Colorado, Apr. 22-25, 2002.

KEYWORDS: Rotor; Aerodynamics; Tilt-rotor; Prop-rotor; Unmanned Air Vehicle; Unmanned Air System